AVIATION

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The Curtiss "Oriole" which Captain Amundsen is Taking to the North Pole

VOLUME XII
Number 25

Four
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SPECIAL FEATURES

ARMY PURSUIT SHIPS FOR THE PULITZER RACE
PROPULSION EFFICIENCY VS. PERFORMANCE
THE NAVY'S RECORD IN AERONAUTICS
FRENCH AERO ENGINE COMPETITION

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y. under Act of March 3, 1879.

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CONTENTS

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Helium and the ZR3

THE report that the U. S. naval airship ZR3, now under construction in the Zeppelin factory at Friedrichshafen as a "reparation" ship, is to be filled with helium for her transatlantic journey, is interesting news.

On one hand the mere fact that the Navy intends to ship to Germany an amount of helium sufficient for inflating the big rigid airship, which is of about 2,400,000 cu. ft. capacity, should be a convincing answer to those who still entertain doubts about the reality of helium production in this country. The opinion seems to be generally accredited abroad that American helium production is something in the nature of an interesting experiment rather than an accomplished industrial process. In particular, the actual amount of helium produced in this country for aerostatic purposes is a matter of speculation by many foreign lighter-than-air men. Thus, the opinion is often expressed that had we had sufficient helium for inflating the Roma we certainly would have done so—thereby preventing the loss of that fine ship and of its skilled crew.

Without going into the merit of this argument, the fact remains that at the time of the Roma disaster there was enough helium on hand to fill a ship the size of the ZR3, which gas had been extracted at a cost of about 13 cents per cubic foot. In comparison with hydrogen, which costs from one-half to one cent per cubic foot, the production of helium may seem a costly undertaking. As a partial insurance against fire hazard, it cannot be said, however, that this is paying too much for it, the more so as reasonable hope exists of reducing the production cost of helium to at least one-half, and possibly one quarter, of what it is today.

To achieve such a result further experimentation is needed. The helium maintenance fund of $400,000 asked for by the Chief of Naval Aeronautics at the recent hearings of the Senate Appropriations Committee, should, with a like sum provided by the Army Air Service, make this possible in addition to keeping the Fort Worth plant in operation at full capacity. At the present time this plant has a production of from 10,000 to 12,000 cu. ft. of 95 per cent purity per day, which seems inadequate in case the Army and the Navy should fill all their ships—including the ZR1 and the ZR3—with helium. With the necessary appropriation, which was lacking last year, the Fort Worth plant should be able to produce almost 40,000 cu. ft. per day, an amount which should suffice for present requirements.

In view of the important role that will devolve upon airships in both the commercial and the military, or rather the naval, fields once the use of helium and heavy-oil engines will have eliminated the fire hazard, it is to be hoped that Congress will not reduce the amount asked for by the Chief of Naval Aeronautics for the maintenance and development of helium.

The Encouragement of Aviation

AMERICANS who wonder at times why in this otherwise so progressive country the development of public air transport still lags, and sorely so, behind that obtaining in other countries, may find a partial answer to their wonderment in a photograph reproduced in this issue. The illustration in question shows President Millerand of France, accompanied by the French Under-Secretary of State for Aviation and some of the most notable aeronautical men of France, at the recent flying meet held at Le Bourget airport, near Paris.

Reports dealing with air transport in Europe hardly ever fail to mention the subsidy which the various governments grant to the aviation enterprises, implying to all intents that this subsidy is a sort of a universal panacea to the ills of aviation. This is, in all truth, creating a misleading impression. The subsidies have a good deal to do with the success of commercial aviation in Europe, but they are not only the monetary kind—there is something abroad which for want of a better term we shall call a "moral subsidy", and this is not the least important factor in the problem.

Taking the case of France as an excellent example, there is hardly a flying meet, an aeronautical show, an airport inauguration, where some representative of the central government is not present in an official capacity. In most cases the Under-Secretary of Aeronautics *flies to the place* in a commercial airplane, thus giving tangible form to the interest the government manifests in the development of aviation. At the recent seaplane meeting at Marseilles the Under-Secretary of Aeronautics arrived from Paris via the air route under conditions of such low visibility that for most of the 450 miles of the journey the machine was flown above the clouds by the aid of instruments.

This, then, is the kind of encouragement which we consider a "moral subsidy". That its value is very great should not be doubted for an instant. It is unfortunately a fact that altogether too many people think that the success of commercial aviation is exclusively dependant upon the efficiency of the airplane and the skill of the pilot. But aviation is not merely an aggregate of more or less perfect machinery, mechanical and human—it needs, besides, enthusiasm to carry it along, and to create this enthusiasm encouragement is necessary.

This is where we, in America, are very badly deficient. Our civil aviation may do without financial subsidies, if it must, but it does need moral subsidies to keep it climbing. If we had a government agency charged with the control and direction of civil aeronautical affairs, with the right man at the head of it—preferably a man with some flying experience—the situation would soon change for the better. The Wadsworth Bill provides for just such an agency—but it still awaits the pleasure of Congress to become operative.

Propulsion Efficiency vs. Performance

Influence of Propulsion Efficiency on the Performance Of Airplanes Demonstrated by Some Well Known Examples

By Roy G. Miller and F. E. Seiler, Jr.

One of the most important aerodynamic considerations in airplane design is propulsion efficiency. This term does not mean simply the efficiency of the propeller acting as an isolated unit but rather its effectiveness in generating thrust in the proximity of the fuselage, the radiator and the exposed structural parts. The ship designer knows that the water propeller is about 7 per cent more efficient as a pusher than as a tractor, but in airplane design the propeller position generally conforms to structural convenience rather than to a careful analysis of the losses involved. The presence of the radiator and structural parts exposed to the slip stream makes propeller position even more important for the airplane than for the ship. On the other hand, the relatively large size of the airplane propeller makes it adaptable to special installations which would not be practical in the case of the ship's propeller.

Available Data

Data furnishing a basis for the calculation of propulsion efficiency have recently been published by the British Aeronautical Research Committee. Reports and Memoranda, Nos. 603 and 688, describe gliding and free flight tests for a standard SE5 as compared to a modified SE5. The object of the tests was a thorough comparison between two models, but, aside from this, very valuable conclusions may be drawn from the results of the tests and applied to the feature of propulsion efficiency.

In these tests the head resistance of the machine was determined at a number of flying speeds by gliding at each speed in turn with the propeller stopped and measuring the gliding angle by means of a barograph. A series of climbing tests were then made with full throttle and the rate of climb recorded for each air speed. The horsepower required for each run with full throttle was calculated from British data and was based on the resistance in a glide (corrected for the resistance of the stopped propeller) plus the component along the flight path required to lift the plane at the rate of climb which was established by the climbing test. The propulsion efficiency was taken as the horsepower required, divided by the brake horsepower of the engine. This differs from the efficiency plotted in R & M 688 which charges the total resistance of the fuselage and landing gear against propulsion because the object of their tests was to compare two different fuselages. The true maximum propulsion efficiency was calculated to be approximately 70 per cent, while the probable maximum propeller efficiency is better than 80 per cent. This means a 10 per cent loss due to the mutual interference between the propeller and the airplane.

The Gallaudet Model D4 seaplane, with a geared propeller amidships

During the summer of 1918 the Germans conducted free flight tests which determined the propulsion efficiency of the Brandenburg seaplane. The results of these tests were recently published for the first time by the National Advisory Committee for Aeronautics and reprinted by AVIATION, April 24, 1922. The maximum propulsion efficiency of the Brandenburg seaplane was found to be about 71 per cent, which corresponds very closely to the 70 per cent as determined for the SE5.

It is a very simple matter to demonstrate what these propulsion losses would cost in terms of pay load in the case of a commercial craft.

Assume the following characteristics:

Power loading	15 lb./hp
Structure (40%)	6 lb./hp
Power plant	3 lb./hp
Fuel and oil (5 hr.)	3 lb./hp
Pilot	0.5 lb./hp
Pay load	2.5 lb./hp.
Propulsion efficiency	70 per cent

Now suppose that a new machine can be designed which will have a propulsion efficiency of 80 per cent with the same power plant. An equal performance could be obtained with a percentage increase in the gross load equal to the percentage increase in effective horsepower.

New gross load (15 x 80/70)	17.17 lb./hp.
Structure (0.40 x 17.17)	6.87 lb./hp
Power plant	3.00 lb./hp.
Fuel and oil	3.00 lb./hp.
Pilot	0.50 lb./hp.
	13.37 lb./hp

New pay load = 17.17 — 13.37 = 3.8 lb./hp
Increase in pay load = 3.8 — 2.5 = 1.3 lb./hp
Percentage increase = 1.3 x 100/2.5 = 52 per cent

Most changes that contribute to propulsion efficiency will also reduce the head resistance. With this two-fold benefit it is not inconceivable that the above improvement in pay load

The Spad pursuit airplane—one of the best machines of its class used in the late war

may be accomplished even if the propulsion efficiency is not made equal to the efficiency of the propeller.

Comparison of Machines

The significance of propulsion efficiency has been well demonstrated by the Gallaudet D4 seaplane, designed by E. F. Gallaudet, an early pioneer in aeronautics, all of whose designs have demonstrated his keen appreciation of the item of propulsion efficiency. In the D4 structural considerations were made distinctly secondary to efficient propulsion. The engine was geared to the propeller which rotated amidships about a circular fuselage. A maximum speed of 119 m.p.h. was attained, using a 360 hp. Liberty engine, and carrying a gross load of 5440 lb. Compare this performance with that of the R6L using the same engine and making a speed of 104 m.p.h., while carrying a gross load of only 4630 lb. The Kerber fineness for the D4 is 113.5 and for the R6L it is 100. This indicates that the D4 has an L/D equal to 1.46 times that of the R6L.

What may be accomplished by improving the symmetry and rounding the corners of a fuselage behind the propeller has been definitely shown by the USXB1A. Using the same general arrangement and the same wings as the Bristol Fighter, the Engineering Division of the Air Service re-designed the fuselage, the result being a very clean streamline form. The Bristol Fighter had a Kerber fineness of 102, while the USXB-1A showed a factor of 104. This represents an increase of 6 per cent in the L/D. Another good example of machine with good symmetry in the slipstream is the Spad pursuit plane, which was one of the best types used in the late war. The Spad has a Kerber fineness of 109, which represents an L/D 4 per cent higher than that of the flat-sided British SE5 which has a fineness factor of only 107.5 in spite of the fact that the SE5 is fitted with streamline wires while the Spad employed cable.

The Gourdou monoplane, one of the best post-war French pursuit planes, has accomplished a remarkable performance by the use of a symmetrical streamline fuselage and by placing the wing above the fuselage and almost entirely out of the slipstream. This machine attained a speed of 152 m.p.h. with a 180 hp. engine. The Kerber fineness is the highest ever recorded, namely 122. Compare this with the M8, which is a monoplane with a similar wing truss, but an unsymmetrical flat-sided fuselage, the radiator all below the thrust line, and the wing attached directly to the top of the fuselage. The M8 has a fineness factor of 102.5, which is fairly high considering the poor propulsion efficiency. This incidentally proves the merit of the M8 wing truss arrangement which was utilized to such good purpose by Gourdou. Owing to its greater refinement in the item of propulsion efficiency the Gourdou has attained an L/D 68 per cent higher than the M8.

The British SE5 pursuit airplane, developed by the Royal Aircraft factory at Farnborough

One important question which naturally comes to the practical mind is whether propulsion efficiency is not attained at too great a sacrifice in weight. The answer is that any one feature may be easily carried to extremes by not properly compromising between contending elements of design. It is practical to go the limit only with those elements which improve

the efficiency in one respect without reducing it in another. For instance, a symmetrical fuselage or nacelle reduces both resistance and interference, but very little is added to weight; in fact, the weight is sometimes reduced.

The Geared Propeller

The geared propeller is almost a necessity if the maximum propulsion efficiency is to be attained. This permits placing the thrust line near the center of frontal area, thereby improving the symmetry. The propeller is increased in size and rotates at a lower and more efficient speed. The increased size and reduced speed of the slipstream minimizes resistance and interference. Aside from the feature of propulsion, gears permit the engine to be run at greater power and economy. That gears will stand up in service has been well proved by the Napier Lion engine. It is rumored that the latest Spad

Effect of Propulsion on Use of Wind Tunnel Data

The means of propulsion for full scale machines has been the greatest stumbling block to a connection between wind tunnel tests and full scale performance. The effect of the slipstream on the tail surfaces has upset many carefully prepared stability calculations. Losses in propulsion efficiency have reduced the full scale performance of machines below what tests for scale effect have promised. Wind tunnel tests on thick wings suitable for internal bracing have promised greater improvements over the externally braced wings than have actually been proved by full scale machines.

Proposed Free Flight Tests

A very simple schedule of free flight testing is proposed as a basis for the accurate determination of propulsion efficiency.

The USXB1A airplane, developed by the Engineering Division, Air Service, from the Bristol Fighter

will be equipped with this British engine in spite of the French reluctance to use a foreign engine.

The latest development in geared drive in this country is the three-motored engine nacelle built by the Gallaudet Aircraft Corp. for the Navy's Giant Boat. Three Liberty engines are geared to a single propeller which is 18 ft. in diameter and rotates about the nacelle near the nose. The nose is stationary and is supported through the propeller shaft. The nacelle occupies a very small portion of the slipstream on account of the size of the propeller. The fact that any engine of the group may be declutched and repaired at any time during flight and put back into service without stopping the propeller adds greatly to the reliability.

The Pusher Propeller

The pusher propeller as a means of improving propulsion efficiency deserves further mention. Unfortunately this desirable feature involves several serious compromises. Chief among these is the fact that power plant weight should be placed well forward to balance the machine and make it possible to place the variable fuel and pay loads near the center of gravity and in a safer position in the event of a crash. A solution of this difficulty involves the weight and complication of shafting. Another bad feature of the pusher propeller is the difficulty of adapting it to a land machine having a single engine. Ground clearance for the propeller necessitates carrying the weights high, making the machine apt to nose over in landing. The placing of the engine above or behind the passengers makes the pusher dangerous in a crash. The pusher propeller works to its best advantage in the flying boat, where it has recently demonstrated its merit in the remarkable performance of the Loening Air Yacht.

The first step in the procedure would be a series of gliding tests at various air speeds.

In the calculation of propulsion efficiency from the data in R & M 603 and 688 the only possible source of error is in the assumption of a resistance coefficient for the stationary propeller in a glide. This error could be minimized by permitting the propeller to run at the speed of zero thrust. The propeller speed for zero thrust corresponding to each air speed could be very easily calculated if a curve of thrust plotted against V/ND were available from a wind tunnel test on a model of the propeller. The pilot would only have to throttle the engine down to the predetermined tachometer reading and glide steadily at the specified air speed. The angle of glide would be determined by a barograph carried in the machine. Knowing the weight and angle of glide, it would be a simple matter to determine the total resistance of the machine for each air speed. The machine should then be flown with full throttle at each air speed, and a barograph record taken of the climb. The pilot should read his tachometer during each run. The total head resistance at each speed plus the component along the flight path required to lift the plane at the rate of climb would furnish a means of calculating the horsepower required. It would be easier to calculate the horsepower required if the machine were flown with just enough throttle to maintain horizontal flight at each speed, but the throttle would require elaborate calibration tests in the dynamometer laboratory to determine the brake horsepower of the engine for each run. The far simpler method is to absorb the surplus horsepower by climbing, and to use the power curve for full throttle which is already available from the standard dynamometer tests.

The importance of taking the rate of climb at an altitude corresponding to a standard air density is apparent. The

The Gourdou pursuit plane—a parasol type of very high performance

horsepower required divided by brake horsepower of the engine would give the propulsion efficiency.

A comparison of the proved propulsion efficiencies of a large number and variety of machines would furnish very valuable data to aid in determining what elements contribute to efficient propulsion and to what extent. The separation of this one important feature would also assist in a systematic analysis of other aerodynamic features if used in conjunction with the complete performance data and the Kerber performance charts.

Johnson Airplane & Supply Co.

Evidence of the gradual stabilization of the aircraft industry on a peace time commercial basis is now frequently coming to this publication.

An interesting sidelight on this improved condition are the attractively edited booklets, catalogs and advertising literature being circulated by the larger aviation supply companies, in which definite facts and prices are given covering every item of supply and equipment for the airplane or pilot.

A recent instance of this is the general price list, Catalog No. 3, of the Johnson Airplane and Supply Co., of Dayton, Ohio, who advertise their business as the "largest commercial aviation supply house in the country". This is an attractive booklet of 12 pages giving, in indexed form, and in great variety under each heading, description and prices of every flying requisite from "ailerons", to "wood, streamline, for wires", backed by the guarantee, "our customers must be satisfied always. If not, your money refunded."

The Johnson company report a very satisfactory growth in their business.

Fokker Sales Expanding

The success of the Fokker F3 cabin airplanes on the London-Amsterdam and Rotterdam-Hamburg lines during the last year has evidently favorably impressed the promoters of the new lines which are commencing operation this summer in Europe. Fokker cabin planes are at present, or will shortly be, running regularly on the following lines:

London-Rotterdam-Amsterdam (Dutch K.L.M. line)
Rotterdam-Hamburg-Copenhagen (Danish line)
Danzig-Konigsberg-Riga (German-Russian lines)
Königsberg-Moskow (German-Russian lines)
Amsterdam-Paris (Dutch K.L.M. line)
Madrid-Vigo (Spanish line)

According to *Flugsport*, the inauguration of the Königsberg-Moscow service took place on April 30, when the Fokker airliner RR1 covered the 720 miles separating the two cities in a total elapsed time of 9 hr. including stops en route at Kovno and Smolensk. The aviators were given a cordial reception by the director of the Russian air fleet and various Russian fliers. On the following day the RR1 carried some of the chiefs of Soviet Russia over Moscow, and a second Fokker airliner, RR3, arrived from Königsberg.

As a result of this service the time of travel between Berlin and Moscow has been reduced from five and a half days to 22 hr.

The Army Pursuit Ships for the Pulitzer Race

The following additional information is now available with regard to the participation of the Army Air Service in the forthcoming Pulitzer Trophy race, which was briefly reported in the June 5 issue of AVIATION.

The participation of the Air Service in America's aeronautical speed classic was decided with a view to developing a type of pursuit plane greatly superior in speed to that in service at present. Today the fastest Air Service pursuit ship has a maximum horizontal speed of about 160 m.p.h.

Accordingly the Air Service has let contracts with four aircraft manufacturers for the construction of racing airplanes which are to be entered in the Pulitzer Trophy race, to be held at Detroit about next October. The names of the contracting manufacturers as well as the number and general characteristics of the machines they are called upon to produce are as follows:

Curtiss Aeroplane and Motor Corp.—Two airplanes fitted with 375 hp. Curtiss CD12 engines.

Loening Aeronautical Engineering Corp.—Two airplanes fitted with 600 hp. 12 cyl. Packard engines.

Thomas-Morse Aircraft Corp.—Two airplanes fitted with 600 hp. 12 cyl. Packard engines.

Lawrence Sperry Aircraft Co.—Three airplanes fitted with 390 hp. 8-cyl. Wright Model H3 engines. The latter three machines will be cantilever monoplanes with retractable landing gear, and will be built to the designs of Alfred Verville, of the Engineering Division, Air Service, McCook Field, Ohio.

The Curtiss, Loening and Thomas-Morse companies have been given considerable latitude in the design of the airplanes contracted for, the main purpose of the Air Service being to obtain a type of single-seater which would possess the highest possible performance applicable to pursuit work. For this reason the contracting manufacturers have been impressed with the military importance of employing methods and practices which would be applicable to pursuit type ships rather than to produce airplanes designed and built primarily and fundamentally for ground level performance. In other words the machines the Air Service desires to see produced shall, while possessing the utmost performance obtainable with a given engine, be promptly capable of adaptation to pursuit work, and not be racers pure and simple which would be difficult of employment under normal Service conditions.

While these requirements make the work of the designers much more difficult, since they will have to conciliate many conflicting features in airplane design, it is confidently hoped by the Air Service that the competition afforded by the Pulitzer Trophy race will produce a design of single-seater pursuit ship far in advance of that with which this or any other army is now equipped.

Another point which the Air Service wishes to bring out is to determine the amount of time required by aircraft manufacturers, to design, build and test a totally new and specific type of airplane. There are scarcely four months left until the time of the race, so that the results of the contracts will afford a fair example of the peace-time production speed of our aircraft plants in the matter of original types.

The Navy's Record in Aeronautics

Statement of Admiral Moffett before the Naval Appropriation Committee Regarding Post-War Development of Naval Aircraft

The Naval Aviation Appropriations have each year contained a liberal provision for experimental and test work, and I now desire to place in the record a brief summary of what I consider to be the outstanding results from the wise policy of Congress in granting such funds, and to indicate to the Committee that the country and the art in general have been advanced by the technical progress which such appropriations have made possible. I need not draw the conclusion that resultsronet The results I summarize certainly show that the Navy Department has developed an operating and technical organization that can be counted on to lead the march of progress if given the opportunity.

Trans-Atlantic Flight

The first post-war accomplishment of Naval Aeronautics was the trans-Atlantic flight of the NC4 with which the Committee is familiar The NC type of flying boat still stands as the largest and most powerful flying boat which has successfully flown Larger boats have been built abroad, but so far as I know with entire lack of success in actual flight.

Triplane 18T

In cooperation with the Curtiss Aeroplane & Motor Corp., and at Navy expense, the 400 hp Triplane (Model 18T) with a new Curtiss CD12 engine was developed and flown The speed shown of 162 m.p h. in 1919 made it then, as it is still, so far as I know, the fastest two-seater fighting plane in the world.

World's Speed Record

At Omaha in November 1921, a Navy plane with a new Navy-developed engine broke the world's speed record for a closed course. The same plane holds the American speed record for a straight course. A second Navy plane of another design holds second place for speed over a straight course. The development of engines of high power, and planes of extreme aerodynamic refinement are of the greatest naval value. It is hoped that the fall new planes now building will set the speed record a notch higher

Catapults

The Navy has designed, developed, built and successfully tested a catapult for launching airplanes from battleships. The Maryland is now going to sea with the latest catapult fitted and provided with airplanes as a regular part of her equipment In future, battleships need not permit hostile bombing planes to approach The defending combat planes will be shot into the air to drive them off.

Torpedo and Ship Planes

The past year has marked the successful development by the Navy of torpedo carrying seaplanes. Three types have been produced under Navy control and with Navy funds by contractors. One type is an unbraced monoplane of low visibility and high speed Another is made entirely of metal The third is a small compact biplane with interchangeable landing gear so that it can be used to land on a carrier or on the sea.

To meet the special demand of the Navy for a small combat plane of high performance and yet very compact and easily taken down for stowage, the Navy has designed, built in Naval shops, and successfuly flown a new plane equipped with the new Lawrance air cooled engine developed with Navy funds for this project. The development of the combined project of a radically new type of both engine and plane was technically extremely difficult, but has proved remarkably successful.

Airships

The development of airships in this country was initiated by the Navy on the declaration of war by designs of non-rigid airships for submarine searching which designs were turned over to contractors and successfully produced The design and building of non-rigid airships has been continued, and to date six successful types have been built, each an improvement over the last.

The design and construction of rigid airships of the Zeppelin type was undertaken after the War, but first the special German materials had to be made available. The secrets of manufacture had to be learned by painstaking research and experiment on the part of the Navy Now, all special materials are available, the design work completed, and construction of the first rigid airship, the ZR1 is under way at the Naval Air Station, Lakehurst, N J

Metal Airplane Construction

Duralumin is the German alloy of aluminum necessary to build Zeppelins. The development of American-made duralumin was initiated and financed by the Navy. The result is now successful and two large concerns are making it for the Navy, but also commercially for the aeronautical, electrical, and other trades in general.

The development of American-made duralumin by and for the Navy has made it possible for airplane builders to make use of this material in airplane construction. One Navy contractor is today flying for test a torpedo plane built all of duralumin, the first all-metal airplane built by an American constructor Another Navy contractor is building all-metal spotting planes for the Fleet, and others are using metal for a large part of their construction

Fuel Injection Engines

It is accepted generally by aviation authorities here and abroad, that one of the most important developments in aircraft power plants is to make practicable the use of heavy oil fuels. That is to say, engines which, like the Diesel engine, will operate successfully on heavy oil for fuel, will inject the fuel directly into the engine cylinders, and which will fire the charge spontaneously, thus eliminating, in a large measure at least, the fire hazard present in the use of highly volatile gasoline for fuel, and avoiding the difficulties inherent in the use of carburetors, and complicated ignition devices.

The only development work which has been undertaken or which has met with any success in this country for the application of these principles in aircraft engines has been initiated, fostered, and largely financed, by the Navy This has been a most difficult undertaking, but although the problem has not been completely solved, tests of experimental engines recently completed indicate the strong probability that the use of this type of engine in aircraft practice will be entirely practicable. The progress which has been made thus far is in advance of any other known development in this country, and is not surpassed by any known development in the world

The only air-cooled engines of American design or manufacture which have yet been developed and successfully flown have been initiated by the Navy, developed under Navy control, with Navy funds, and first flown in Navy aircraft

The latest Navy developed air-cooled engine—the Lawrance 200 hp Model J1 engine—is superior in performance, weight per horsepower, and durability to any other known engine of comparable power which has yet been developed and successfully flown either in this country or abroad

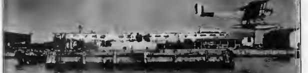
The Navy has under way at present two entirely new experimental lines of development in air-cooled aviation engines,

both of which, if successful, promise a material advance in the state of the art of engine building, and both of which should make for greater reliability, and superior aircraft performance.

Airship Engines

The only modern airship engine development which has been successfully accomplished in this country has been accomplished under Navy control, and with Navy funds It is a fact that every American-built airship which has been flown in this country since the war has been equipped with engines which have been developed entirely under Navy control and with Navy funds

There have recently been completed and thoroughly tested under Navy control, and with Navy funds, two new types of airship engines, which in performance, weight per horsepower, fuel economy, dependability, and durability, are at least equal



Official Photo U S Navy

Remarkable photograph of a naval seaplane at the moment of leaving the launching catapult

to the best engines developed in any country in the world. One of these engines develops the greatest power output per cylinder of any successful aircraft engine that has yet been developed either in this country or abroad, so far as is known

Durability of Engines

The Navy has long realized the urgent necessity for realizing a greater degree of dependability and durability in all types of aircraft power plants. The greatest obstacle which has existed, and which still exists, to the development of both commercial and military aviation has been the relatively low degree of dependability, and the relatively large cost of maintenance of aircraft and particularly of aircraft power plants. These factors have made necessary the provision of large and expensive repair establishments, and of inordinately numerous and highly skilled repair and maintenance personnel

The standard of durability of aircraft engines in this country and abroad has been set by the requirement that an engine must satisfactorily complete a 50 hr endurance test. In all the Navy's development work, both in new types and modifications in old types considerations of durability, dependability, low first cost, and low cost of maintenance have always held an important place. The standard acceptance test for new types of aircraft engines has been, in this country and still is in countries abroad, a 50 hr run. An engine recently built for the Navy has just completed a test of 300 hr. of running—six times as long as the usual acceptance tests. This is the first aircraft engine ever built to complete so severe a test As the result of information gained in this test and previous unsuccessful attempts to measure up to so high a standard, it is confidently expected that a number of other engines developed since the war to meet the requirements of the Navy will successfully complete similar tests.

Among these are listed the following types of engines which have been developed entirely under Navy control and with Navy funds. Only those types are mentioned which have been built and thoroughly tested and proved, and which can be immediately put into production in large quantities on short notice, and only those types are mentioned whose development has been out of Naval Appropriations:

- The Lawrance Model J1 200 hp air-cooled engine.
- The Wright Model E2 180 hp water-cooled engine
- The Aeromarine Model U8D 200 hp water-cooled engine.
- The Curtiss Model CD12 350 hp water-cooled engine.
- The Packard Model 1A1551 300 hp airship engine.
- The Wright Model D1 400 hp. airship engine.
- The Wright Model T2 525 hp water-cooled engine.
- The Aeromarine Model U6D 130 hp water-cooled engine.

These engines are all post-war developments, and each engine mentioned is at least the equal of any other engine of the same class that has yet been developed in this country or abroad

The Liberty Engine

The Liberty engine, developed during the war, was at that time the equal of any type developed for the same type of service, and although the Liberty engine is still being used extensively in this country and in England, and in France, it is rapidly becoming obsolete and will within the next few years have to be replaced entirely A number of important modifications have been made by the Navy in this engine since the war, which have practically doubled its life, and which have been universally adopted throughout the country.

Reduction Gears

The development of reduction gears for aircraft engines has been one of the most difficult problems which has confronted the industry in this country At the end of the war no suitable type of reduction gear had ever been built in this country, in spite of repeated efforts. Development work has been proceeding in this line under Navy control, for three years, and for the past year engines fitted with reduction gears have been in successful operation in naval aircraft in every day flight service In the course of this work an industry has been developed which can manufacture successful reduction gears for all types of engines.

Concurrent with this development has come the problem of gearing two or more engines to one propeller, thus making possible the construction of the so called "giant airplane." The Navy has developed, built, and thoroughly tested the largest single aircraft power unit ever built. This unit consists of three 400 hp engines, all driving through clutches and gears one single propeller 18 ft. in diameter, the largest aircraft propeller ever built thus far

The post-war record of the Navy in aircraft power plant development stands as follows:

The Navy has been responsible for the development of the only successful air-cooled engines of American manufacture that have yet been flown.

The Navy has developed every successful engine of American manufacture which has been used in lighter-than-aircraft, and the only reduction gears for aircraft engines that have proved successful in flight operations.

The Navy has been responsible for practically all of the development thus far accomplished toward the use of heavy oil engines on aircraft.

A Navy developed engine has recently passed the most severe duration test which has ever been completed by any aircraft engine, and Navy developed engines have proved on test to have a greater operating life between overhauls and greater dependability than any other American built engines, and are at least equal in this regard to the best engines built abroad.

The Navy has developed the largest aircraft power unit ever built, and has been first in the United States to succeed in gearing two or more aircraft engines to one propeller in a practical manner

The Navy has today a thoroughly developed and *proved* type of engine for every class of naval aircraft service, with complete detailed production plans and specifications for each type. The design of every type is an American development and is especially adapted to American quantity production methods and can be manufactured cheaply in large quantities in any well equipped manufacturing plant in the country in case of emergency. And every type is, in performance, weight, durability, dependability, and general suitability, at least equal to the best engine in the same class which has been developed in any other country in the world.

Airplane Lands on Alpine Summit

The Zugspitze peak, in the Bavarian Alps, was recently the scene of unwonted activity, when three German fliers, the ex-Captain Hailer, the engineer Rockenfeller and the photographer Ruge, landed in the Rumpler airplane D98, on a snow field right under the peak. The dangers run by that daring enterprise can hardly be exaggerated. In fact, the dimensions of the ground at the airmen's disposal at a few meters' height below the summit, were extremely limited, while violent air currents, mixed with snow storms, were encountered.

The airmen came through the trial unscathed, but the airplane had to be abandoned as it proved impossible to fly off the snow field.

The airplane and its crew which landed near the summit of the Zugspitze

Curtiss Oriole to the North Pole

One of the most important pieces of equipment which left Seattle with Capt. Roald Amundsen's North Pole expedition on the three-masted Schooner "Maud" is a stock Curtiss "Oriole" with a Curtiss C6 160 hp. motor, equipped with electric starter This plane was presented to Captain Amundsen by the Curtiss Aeroplane and Motor Corp and christened at the Curtiss Flying Field, Garden City, L. I., on April 6, 1922, and now bears the name Kristine. The fact that Captain Amundsen has equipped his expedition with a modern airplane shows that he appreciates the advantages to be gained by this means of transportation. It is his plan to drift across the Polar Basin in the vicinity of the North Pole with the schooner Maud, and during the passage make exploring and mapping trips in all directions radiating from the supply ship, using the latter as a base By doing this it will be possible to cover a vastly greater area of country and to secure photographs from which can be produced an accurate map of the country giving both the geography of the territory and the general condition of the terrain.

Captain Amundsen has secured as his pilot Lieut. Oskar Omdal, formerly of the Norwegian Navy Lieutenant Omdal has selected a specially qualified crew to keep the plane in condition to operate under the severe weather conditions which they expect to encounter The Oriole has been equipped with snow skids which are interchangeable with the landing wheels and tail skid. Additional gasoline tanks have been installed making the total fuel capacity 94 gal. of gasoline, sufficient to cover at cruising speed a distance of 640 miles.

To operate under the varying weather conditions which will be met on this expedition an airplane must be equipped with special devices for regulating the temperature of the engine, of the cooling water and of the lubricating oil and in this case the Curtiss company have gone a step further and equipped this plane with a Reed duralumin propeller to withstand varying temperatures and moisture conditions. In case of a bad landing it may be possible to salvage a propellar of this kind, where with a wooden propeller the crew would be hopelessly stranded

A detailed summary of the Oriole is as follows.

Weight of machine empty (with wheels) ..	1788 lb
(with skids) .	1845 lb
Oil (5 gal) .	37 lb
Gasoline (94 gal)	564 lb
Water (6 6 gal)	55 lb
Pilot	100 lb
Passenger	166 lb
Weight with full load	2770 lb
Loading Area . .	399 7 sq ft.
Wing loading	6 93 lb /sq ft.
Power loading . . .	17.29 lb /hp
High Speed	96 m.p h.
Low Speed .	45 m p h

One of the objects in the presentation by the Curtiss Aeroplane and Motor Corp of this ship to Capt. Amundsen was the desire to learn something of the operation of the C6 engine in the Oriole under the severe atmospheric conditions which will be encountered in the Arctic. It was further desired to have the Reed metal propeller, which was invented by S A Reed, and of which a number have been built under his direction at the Curtiss factory, tried out under the atmospheric conditions which a metal propeller is supposed to be particularly adapted to withstand.

The French Aero Engine Competition

Two Prizes of One Million Francs Each Assigned to Competition for Best 350-450 hp. Aircraft Engine

The regulations for the French contest for aeronautical engines which is to be held during 1924 have just been issued. This contest, which is due to the initiative of the Comité Français de Propagande Aéronautique, is supported by the Under Secretary of State for Aeronautics. The committee and French air ministry have each assigned a sum of one million francs for the purpose of the competition.

Distribution of Prizes

The million allocated by the government is to provide two prizes each of 300,000 francs for engines of French origin, and the million allocated by the committee is to be devoted to purchasing for the benefit of the French government the French manufacturing rights in the engine which is adjudged to be the best. Engines of any origin, except those from enemy countries, are eligible for the competition, but not for the two prizes above mentioned as reserved for French engines. In the event of the winning engine being of foreign origin, in addition to the sum of one million francs, provision is made for the payment of royalties at a maximum rate of 8000 francs per engine for the first 100 engines built, decreasing 1,000 francs at each 100 engines, till the 600th whereafter a uniform maximum royalty of 2000 francs per engine is payable.

Entries will be received up to Dec. 1, 1922, by the Commission d'Aviation of the Aero Club of France if accompanied by an entrance fee of 20,000 francs. Entries will be received up to Dec. 1, 1923, at an entrance fee of 40,000 francs. Foreign competitors will in addition be required to contribute 10,000 francs toward the cost of testing Half of the entrance fees will be returned to all competitiors who pass the eliminating tests. The special contribution of 10,000 francs from foreign competitors will be returned to those who may withdraw before the official opening of the trials.

Engines must be of the internal combustion type, and of a normal output of between 350 and 450 hp The weight per hp., including the weight of fuel and oil for 5 hr must not exceed 3 3 kg (7 26 lb.) per hp The speed of rotation of the propeller is not to exceed $\frac{32{,}000}{\sqrt{H.P}}$ r.p.m.

All engines are to be fitted with a self-starter such that the engine may be started at a distance without turning the engine by hand. This starter alone is to be used for starting during the whole of the trials

Nature of the Trials

Engines will be required to undergo eliminating trials, including 5 hr run on an air brake on the test bed, and 2 hr. flight on an airplane which is to be provided by the entrants. Thereafter the engines will be submitted to an endurance test totalling 240 hr run in thirty periods of 8 hr. each on the test bench. The load is to be an air brake of the propeller type, supplied by the competitor, and the engine will be mounted on a pivoted test bed, which will allow measurement of the brake horsepower The total of 240 hr. run is required to be made in not more than 100 days (not more than one run per day) and penalty marks will be awarded for every delay in starting, for every stoppage during a run, for every day taken to compete the tests in excess of the possible minimum of thirty days, and for every repair and replacement made during the whole period. Any individual run may be annulled on account of delays in starting, stoppages, or failure to develop the required power. The whole endurance test may be annulled if more than ten such runs have been annulled, if more than thirty days elapse between any two consecutive 8 hr. runs, or if the total repairs or replacements exceed certain specified limits. A second attempt may be made, but is to be completed in eighty instead of 100 days. Such a second attempt is attended by penalty marks.

Marks are to be awarded for the weight per horsepower with 5 hr fuel and oil, as determined from the actual consumption and power developed during the trials. If the weight per horsepower so computed is more than 3 kg per hp the marks are penalties; if less, they are set against penalties. Penalties are inflicted for the air resistance of the engine, which is taken as proportional to the area inside the smallest convex contour which will entirely enclose the projection of the motor on a plane normal to the propeller axis. This area, divided by the normal full power of the engine, is the basis of the penalty marks. The sum of all penalties, less any good marks for low weight per hp., will serve to classify the competitors, the lowest total being that of the winner. One of the 300,000 franc prizes for French engines will be awarded on this same basis. The second 300,000 franc prize will go to the French engine which gives the best results on the two points of weight per horsepower and head resistance.

Where to Apply

Complete details of the rules, conditions of entry, etc. may be obtained on application to the Commission d'Aviation de l'Aéro Club de France, 35, Rue François Ier, Paris

The system of penalty marking laid down in the regulations for this competiton has certain very interesting and somewhat ingenious features, says *The Aeroplane.* The system has obviously been devised with the intention of eliminating so far as is possible, the effects of accidental ill-chance on the prospects of a good engine, and of penalizing very severely any form of consistent ill behavior

Penalities are imposed for all delays in starting, and for stops during test runs. These penalties vary with the time of delay or stop. If the delay does not exceed one hour the penalty on the score of stop or delay goes no further. But if either stop or delay exceed one hour, or if there is more than one stop, the run is annulled. There is a penalty for annulment, and in addition a further penalty for the extra day taken to complete the 240 hr total. And if the stop or delay involves the repair or replacement of any part, there is a penalty for that repair or replacement. This penalty is inflicted for repairs, etc , even if it does not lead to delay or stoppage The penalties are thus cumulative, and increase as their effects become more serious.

Penalizing Replacements

But the method of penalizing for repair and replacements is extremely ingenious, proceeds our contemporary There is a basic scale for these, the penalties increasing with the time needed to carry out the work, whether the work is of a nature which allows immediate resumption of the test, or necessitates "tuning up" and preliminary running before continuance of the tests. Also generally the penalties for the replacement or repair of an isolated piece are less than are those for a complete unit. That is, it is cheaper to replace a big-end bush than a complete connecting rod unit, and it is cheaper to replace an accessory unit such as a magneto than an essential of the engine such as a complete cylinder This is quite apart from penalties which arise from the delay in carrying out the change.

But this basic scale applies only to the first time of repairing or changing a given unit or type of unit. Wherever a part has already been changed or repaired, the penalty for change or repair to a similar part (not necessarily the same part) is to be that in the scale, multiplied by the total number of changes or repairs to the same part or type of part. From this rule plugs and valves are excepted. In their case the penalty is imposed plus the number of preceding replacements.

Limitations of German Aircraft

On May 5, 1922, the Inter-Allied Aircraft Commission in Germany was dissolved, and in its stead a "Committee of Guarantees" was appointed by the Council of Ambassadors to ensure that the regulations framed to define Germany's position in the air are followed. This Committee of Guarantees is composed of representatives of Great Britain, France, Italy, Japan and Belgium. England is represented by three officers, and the other countries mentioned by two officers each. The Committee is to have the right to visit any aircraft factory, or plant devoted to the manufacture or repair of aircraft and aero engines and other material, at any time, and is to be provided by the German government with full particulars of all machines and engines built and of all commercial air services being operated by German firms.

The limitations placed on the manufacture of aircraft after May 5, 1922, in compliance with the terms set forth in a note in the conference of ambassadors, in Paris, dated April 14, 1922, are as follows

1. A single-seater with greater engine power than 60 hp is to be considered a military machine.

2. Every aircraft which is capable of flying without a pilot is considered a military machine.

3. Every aircraft which is armored, or which has any provision for mounting guns, bombs, etc., is considered a military machine.

4. The "ceiling" with full load of any German commercial aircraft is not to exceed 4,000 m (13,100 ft), and the fitting of an aircraft with a high-compression engine will place that aircraft in the category of military machines.

5. The maximum speed with full load and at a height of 2,000 m (6,500 ft.) is not to exceed 170 km (105 miles) per hour at the maximum power of the engine.

6. The amount of oil and fuel (best quality of aviation gasoline) carried on board must not exceed $\frac{800 \times 170}{V}$ grammes for each horsepower (where V is the speed at full power and 2,000 m).

7. Every aircraft whose useful load, including pilot, engineer, and instruments, exceeds 600 kg (1,320 lb.) is considered a military machine if the maximum conditions as under 4, 5 and 6 are attained.

Airships whose volume exceeds the following figures are considered as war material, and are "verboten"—Rigid airships, 30,000 cu m (1,060,000 cu. ft.); semirigid airships, 25,000 cu. m (884,000 cu. ft), nonrigid airships, 20,000 cu. m (760,000 cu. ft.).

Factories turning out aircraft shall be registered. All aircraft and pilots, or pilot apprentices shall be listed in accordance with the conditions provided for in the covenant of Oct 13, 1919. These lists will be kept at the disposition of the guarantee committee.

The stocks of aviation engines, and of spare parts and accessories, shall not be permitted in excess of what will be considered necessary to satisfy the needs of civil aviation. These quantities shall be determined by the guarantee committee.

A revision of the above definitions is contemplated after two years, so that such modifications as the progress of aviation demands may be given consideration.

Aviation Bill for D. of C.

A bill providing for the regulation of air navigation in the District of Columbia was introduced in the House of Representatives on May 31, last, by Mr. Grusman and reported to the Committee on District Affairs.

In the interest of public safety, the bill states, the Commissioners of the District of Columbia are authorized and directed to formulate all necessary and proper rules and regulations respecting air navigation and traffic; to issue licenses for aircraft and aviators or aeronauts; to inspect aircraft; to prescribe routes and avoidance of prohibited areas, as well as to formulate rules for landing and departing from airdromes, and other matters of safety and convenience for air navigation in the District of Columbia.

Such rules will prescribe that no aircraft shall approach within one mile of a public meeting or congregation of over 100 members unless especially authorized by the Commissioners. A person charged and convicted for violation of these rules shall be fined not more than $1000.00 or be imprisoned for not more than one year, or both. The Commissioners may also, at their discretion, revoke or suspend the licenses of violators of the aerial rules.

This bill was introduced in Congress as a direct result of an incident which occurred during the Memorial Day program at Washington, when a civilian aviator flew very low over the crowd, marring the President's address and frightening the people.

As a measure of censure the Secretary of War has revoked the flier's commission in the Air Service Reserve, and has written to President Harding, urging immediate passage of the Wadsworth Bill (S 3076), providing for federal air regulation.

The Glenn L. Martin Flying Field

The Glenn L Martin factory and flying field, shown in the accompanying aerial photograph, is located about seven miles from the center of Cleveland in the eastern section of the city. Situated between the main lines of the New York Central and Nickle Plate railroads and one mile from the lake front, it is readily located from the air. An easily distinguished landmark is the New York Central freight yards, partially shown in the right foreground of the photograph.

This field is open to commercial and civilian fliers and adequate ground service is always available. Underground tanks

Glenn L. Martin Field, Cleveland, Ohio

with a capacity of 2000 gal of high-test gasoline provides for any contingency.

The field is L-shaped and contains seventy acres. The main landing course, cinder-covered, is 1900 ft long and always in good condition, being used daily by the transcontinental air mail service whose hangars and Cleveland headquarters are also located on the field. Weather reports are available through Navy Radio Station NRH operated from the company's field.

Other general information is as follows:

Latitude, N 41° 30'
Longitude, W 81° 42'
Altitude, 762 ft.
Average yearly rainfall, 34.24 in.
Average visibility, fair

French Chief of State Encourages Aviation

President Millerand of France (with bow tie) at the recent Paris flying meet organized by the Veteran Aviators' Club, at his left, M. Laurent Eynac, Under-Secretary of State for Aviation, at his right, M Louis Blériot, the airplane constructor In the left corner of the picture is Alberto Santos-Dumont (adjusting his hat), in the rear row, between M. Blériot and President Millerand, is Count Henri de la Vaulx, the veteran balloonist

Book Review

Verslagen en Verhandelingen Van Den Rijks Studiedienst Voor de Luchtvaart. (Report No 1 of the Aeronautical Institute of the Netherlands Government) 186 pp. illustrated.

This publication contains results of experiments, made in the aerodynamical laboratory, of engine tests and of material tests. It contains besides a description of the wind tunnel and of the distribution of the air flow in that portion of the tunnel where measurements are made. In order to judge the possible measuring errors, the influence of different methods of suspending on the results of force-measurements on models was studied. In some cases this influence is considerable As for each measurement it is necessary to know exactly the velocity, a comprehensive investigation of velocity meters of different construction was made The working and stability of windvanes were also tested

There are also given the results of the examination of an 185 hp Opel—B.M.W. engine under different conditions, that is, with different jets, with different valve timing, with different compression ratio, and with different fuel mixtures.

A report "On the fatigue-resistance of duralumin" contains a bibliography from 1912 to 1921

Another report deals with experiments on seamless steel tubes joined by autogeneous welding. The importance of these tests is obvious in connection with the fact that during the war objections were raised to the extended use of welding, especially to the welding of constructional parts which are in tensile stress. The general opinion was that one could not wholly rely on the personal ability of the workman. In order to draw a conclusion, hundreds of seamless steel tubes of Fokker airplanes were tested by microscopic examination, also tensile, compression and destruction tests were made. It has been found that autogeneously welded seamless steel tubes are equally trustworthy as other joints

Cours Pratique D'Aviation Par le Capitaine Gambier et le Lieut. de vaisseau J. Amet. 292 pp., 210 ill (Librairie Delagrave, Paris)

Among the numerous books written on how and why airplanes fly, there are extremely few which give the lay reader a tolerably complete understanding of the subject without requiring from him a large amount of technical training And even the so-called popular books which are supposed to reach this lay reader give him mostly much thinned-out theory without actually going into the practical side of the subject.

The "Cours Pratique d'Aviation" marks a notable departure in this respect. It starts by giving the fundamental notions of aerodynamics which any person with a high school education can understand. Then it describes the "anatomy" of the airplane, dealing with each part, such as wings, ailerons, fuselage, engine mounting, etc separately, and in this connection it devotes some space to the materials which enter into airplane construction, dealing in particular with the methods employed to preserve them, to detect flaws, etc. Other chapters deal with aeronautical engines and their maintenance, aerial navigation and instruments.

Throughout the book the authors have intelligently and successfully striven to give the reader a means of "appreciating" an airplane. Many pages are devoted to the maintenance of airplanes and engines and from this angle alone the book should be very valuable to mechanics and ground engineers, for this is a subject which is rarely found in print in such a readable manner.

A. R. Mosler & Co. Reorganize

On May 25, 1922, the firm of A. R Mosler & Co., manufacturers of aviation spark plugs, which has been in receiver's hands for a period of about twenty months, was taken over by a new organization headed by a number of prominent eastern financiers, and the business will be hereafter operated under the title of Mosler Metal Products Corp

In addition to a complete line of spark plugs, which the company has been producing, there will be added a number of automotive accessory lines, and a full assortment of radio material

An early announcement will be made covering the full details of the re-organization, as well as the personnel of the new company, and every assurance is extended to the trade, whose business A. R. Mosler & Co have enjoyed for the past twenty-two years, that a very high standard of policy and merchandise will be maintained

Aviation in the Dutch East Indies

In connection with the note published under "Foreign News" in our issue of Jan 30, last, a letter by Lieut. Comdr H. Nieuwenhuis of the Royal Netherlands Naval Air Service, Weltevreden, Java, states that no foreign aviation school is in operation with the consent of the Dutch government in the East Indies. The only aviation schools in existence are the army air service school at Bandoeng, and the naval air service school at Priok, both being entirely under Dutch government supervision. An Englishman, Mr Baker, is temporarily attached to the school at Bandoeng because of the arrival there of Vickers amphibians.

Two or three German fliers are trying to earn a living in Java by giving joy rides and flight instruction on German ex-war airplanes.

New British Air Attache

Takes Up Duties at Washington, D. C.

Malcolm Grahame Christie, Wing Comdr., Royal Air Force, C.M.G., D.S.O., M.C., who on May 1, 1922, was appointed air attache to the British Embassy in Washington, D. C., in place of Air Commodore L. E. O. Charlton, was born in Birmingham, England, on Jan. 27, 1881, the son of J. A. Christie, banker. He was educated at Malvern College, England, and at the University of Aachen (Aix-la-Chapelle), Germany, where he took the degree of "Doktor-Ingenieur" in 1906. The following year Mr. Christie entered the Otto Cokeoven and Construction Co. and later became its general manager and director. He then accepted the post of a lecturer to the Leeds University and the Imperial College of Science, and in 1913 became president of the Otto Coking Corp. of New York.

An amateur aviator since 1911, Mr. Christie joined the Royal Flying Corps at the outbreak of the war and saw active service in France and Belgium. His present rank of Wing Commander, Royal Air Force, dates from 1919.

Wing Commander Christie is a member of the Royal Aero Club of the United Kingdom, of the Royal Air Force Club and of the Royal Aeronautical Society.

Sioux City Bankers Travel by Air

A delegation of bankers from Sioux City attended the meeting of the South Dakota Association of Bankers at Winner, S. Dak., on May 18, by flying there in a large SVA passenger ship furnished by the Curtiss-Iowa Aircraft Corp. The economy of travelling by air was quickly realized by these men. The trip, if made by train, would require two days of travel, whereas by air it took 1½ hr.

Aviation is making great headway in the Seventh Corp Area since the District Conference in March. Extensive plans are under way for regular air service between the largest cities, and the Aero Club of Sioux City is cooperating with the Curtiss-Iowa Aircraft Corp. for extending their lines. A line is planned from Sioux City to Chicago via Fort Dodge and Cedar Rapids, which is expected to be in operation within thirty days. During the summer months lines will be extended to Sioux Falls, S. Dak., Omaha, Nebr., and Kansas City, Mo. Final plans are for developing a line from Sioux City to the Pacific Coast Points.

The Aero Club of Sioux City is one of the largest and most active in America. A fully equipped landing field will be ready in June for transportation lines as well as several privately owned ships. In addition to their local work they are taking an active part in the Seventh Corps Area Association as well as the National Organization work.

New Method of Making Wing Models

The expense of making model airplane wings for use in wind tunnels in connection with tests, will be greatly reduced by means of a new method developed by W. H. Nichols of Boston according to a report made to the National Advisory Committee for Aeronautics, by E. B. Werner of Mass. Inst. of Technology.

A wing-cutting machine recently invented will reduce the cost of making wing models from about $500 to approximately $40, it is said. The wings can be made of aluminum or wood, or even steel, up to a 3 ft. x 6 in. size, in about six hours. Wooden wings should not cost more than $25 it is believed, due to the reduction in material cost.

A recent test model of U.S.A. 27 was made of aluminum, with a maximum error in thickness of only 0.0008 of an inch, and a maximum departure from straightness of any side less than 0.001 of an inch. Officials of the N.A.C.A. believe models can be constructed correct to within 0.0015 in. No polishing or buffing is necessary, as the wing section is made by the cutting machine from a template laid out on a drafting board. This device may be used in making standard wing sections for reference just as standard weights and measures are kept at the Bureau of Standards.

The Safety of Air Travel

British publications are vigorously backing aviation and are doing their utmost to encourage the industry. The recent collision of two air expresses on the London to Paris airway which resulted in the loss of six lives, has occasioned editorial comment on the part of several publications wherein the comparatively few airplane accidents in relation to the considerable number of flights was pointed out.

The *Illustrated London News*, in this connection, devotes an entire page in its issue of April 22, to a graphic chart showing the extent to which commercial aviation was operated between England and the Continent during the years 1920 and 1921. From this chart the following pertinent data is gleaned.

Continental Flights

Registry	No. of Flights 1920	No. of Flights 1921	No. of Passengers 1920	No. of Passengers 1921
British	2,854	993	5,799	5,256
French	657	1,565	486	4,352
Belgian	104	421	98	630
Dutch	5	366	0	480
Others	0		0	13
Grand total	3,620	3,345	6,383	10,731

Goods transported by air—1920—Imported total values £677,047, Exported total values £351,765; 1921—Imported £375,474, Exported £195,826 (Britain). Accidents in British civil aviation (including continental routes):—

Year 1920—out of 42,296 passengers (mileage 546,400 m.) 14 killed, 15 injured.

Year 1921—out of 42,680 passengers (mileage 452,000 m.) 3 killed, 6 injured.

The totals of British civil aviation flights are (for 1920) 26,803 flights, (for 1921) 23,152.

It will be noted from the above that there was a decided falling off in the number of flights made in British machines during 1921 as compared with the preceding year, though in the matter of passengers carried the disparity is not so great, the number in 1921 being 543 less than that in 1920. To offset this, however, a considerable increase in flights and passengers carried by French, Belgian and Dutch machines is shown for 1921 as compared with the 1920 figures. Of much significance are the statistics on accidents, for although the number of passengers taking flights in airplanes during 1921 exceeded the number carried during 1920, only three were killed and six injured during 1921, as against fourteen killed and fifteen injured in 1920, indicating that great strides have been made in the matter of making the airplane a safe means of rapid transportation.

Mexican Cantilever Monoplane

The Mexican military aircraft factory recently completed the construction of a two-seater cantilever monoplane, which has now undergone successful flight tests. The new machine, called the Sonora, follows in its outline that of the war-time Junkers two-seater fighter, but it differs from the latter in that the Mexican cantilever monoplane with the exception of the fittings and covering is built of native wood. The engine is a 110 hp. Le Rhône.

Following are the principal characteristics of the Sonora. With regard to the performance figures it should be noted that Mexico City, where the tests took place, is some 6000 ft. above sea level.

CHARACTERISTICS OF THE MONOPLANE SONORA

Span	33 ft. 8 in.
Overall length	22 ft. 3 in.
Maximum height	7 ft. 6 in.
Total wing area	178 sq. ft.
Engine	110 hp. Le Rhone
Weight empty	1100 lb.
Useful load	440 lb.
Weight loaded	1540 lb.
High speed	100 m.p.h.
Low speed	40 m.p.h.
Climb	3300 ft. in 5 min. 6600 ft. in 12 min. 13 200 ft. in 30 min.
Endurance	3 hr.
Accomodations	2 seats.

ARMY AND NAVY AIR NEWS

Air Service

Consolidation of Air Service Schools—The Secretary of War has under consideration the recommendations of a Board of Officers which he caused to be convened for the purpose of studying the school system of the Army, with a view to such changes and consolidation as would prevent duplication, provide economy of administration and eliminate overhead. A further consideration was to arrange quartering so as to avoid so far as practicable the cost of maintenance of temporary structures.

The following distribution of Air Service Schools has been directed.

The Primary Flying School from Carlstrom Field, Fla., to be moved to Brooks Field, Tex. The observation school from Fort Sill, Okla., will be moved to Kelly Field, Tex., where all advanced instruction will be given in observation, pursuit, attack and bombardment. It will thereby be practicable to assign the graduates of the Primary Flying School to the advanced school at the adjacent field. All heavier-than-air instruction is thus accomplished in the one locality.

The lighter-than-air schools will be located at Scott Field, Ill., by moving thereto the Balloon School from Ross Field, Calif., and the Airship School from Langley Field, Va.

The technical schools will be located at Chanute Field, Ill., where there is now a Mechanics School, by moving thereto the Photo School from Langley Field, Va., and the Communication School from Fort Sill, Okla.

The Field Officers School will be continued at Langley Field, Va.

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Chanute Field—During the period between December, 1919, and July, 1921, approximately 1450 students were placed in the Air Service Mechanics School, Chanute Field, for courses of instruction. Of this number 2.2 per cent were dropped for inaptitude, having failed to make the grade of 70 per cent or above. Prior to December, 1919, 32 per cent of the men entered in school were dropped via the inaptitude route, thus showing that the Trade Test Department has been successful in reducing the failures of the school by nearly 30 per cent. Statistics further show that during the functioning period of the Trade Test, approximately 100 men were rejected as being incapable of assimilating any course of instruction taught at the school.

The immense amount of time and energy expended in the placing of these men in courses which will prove most beneficial to the Air Service and to themselves is not shown in these figures. A conservative estimate of the number of interviews granted, by which the Trade Test Department has attained its enviable record, would reach close onto the five thousand mark, since it is found necessary in 50 per cent of the cases to change the men from their natural desires to a course best fitting their qualifications. The "natural desire" is usually the course for Airplane Mechanics or Airplane Engine Mechanics. In placing a man in a course of instruction, three important considerations must be dealt with, paramount among which being the existing orders from the Chief of Air Service that twenty-two courses of instruction be maintained and in constant operation; secondly, the man's qualifications and, thirdly, the man's desires. The orders from the Chief of Air Service require that a certain proportion of the students of this school be placed in each of the twenty-two courses which are taught, in order that each course may be operating at its full capacity at all times. This is necessary in order to supply the organizations with specialists in the wide and varied trades necessary to properly carry on Air Service work. To meet this condition, men sent to the school for instruction must in many cases be placed in courses which at the outset they do not desire. It can readily be seen that if these men were simply ordered to take a course and placed in that course without further notice, a great loss of efficiency would result, for while a man can be placed in a course of instruction he cannot be forced to learn nor to take an interest in his work. Men would be dissatisfied and the morale of the school would greatly suffer therefrom. The task of "selling" the various courses to the men devolves upon the Trade Test Department. It is something which requires tact, judgment, and a high degree of diplomacy, not to mention the great amount of time.

It is due to the great amount of attention and conscientious application given to this matter that the present efficiency of the Trade Test Department is, as before stated, 97.8 per cent.

The Officer in charge of this department has so many titles that if he had a tin badge for each one and they were pinned on him, the admiring public would have serious difficulty in discovering his noble physiognomy beneath the mass of metals. In addition to this, he is the lowest ranking member of the school's staff and, therefore, catches every job which is tossed nimbly down the line. Having no alternative, he has to do the work. Nevertheless, he has spent, does and will spend many sleepless nights praying Heaven to send a still lower ranking officer to Chanute Field so that he can engage in the daily diversion of "buck passing." Somewhat of an idea of this man's activity may be gleaned from an enumeration of a few of his titles, viz: Officer in Charge of Trade Test, E. & R. Officer; Information Officer, Athletic Officer, Publicity Officer; Morale Officer, Member of G.C.M., Secretary of Officer's Club, Engineer Officer, 15th Observation Squadron; Transportation Officer, 15th Observation Squadron; and Athletic Officer, 15th Observation Squadron. Again a story is told, but not the half of it—not a quarter of it. In addition to handling the duties aforementioned with enviable efficiency, this department is also the recipient of all jobs, ordinary, extraordinary and otherwise, i.e., selling pennants, near beer, auctioning off left-overs from the flying circus, organizing baseball, football, and track teams, building tennis courts and baseball diamonds, running picture shows, promoting boxing matches and coaching athletic teams.

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Scott Field—In preparation for the National Balloon Race an elimination contest was held on May 6 at Scott Field, Belleville, Ill. Two balloons of 19,000 cu. ft. capacity were used, the first piloted by Lieut. J. W. Shoptaw, Chanute Field, with Lieut. Courtland Brown as aid, and the second piloted by Lieut. J. H. C. Hill, Scott Field, with Lieut. James Healy as aid. Both balloons covered in the neighborhood of 110 miles, but Balloon No. 1, though holding a few miles advantage over Balloon No. 2, was in the air fifteen minutes longer. The race was so close that all data has been sent to the Chief of Air Service for his award.

Two of the three balloons entered in the National Balloon Race by the Air Service were constructed at Scott Field. These balloons, known as U.S. No. 2 and U.S. No. 3 have a capacity of 80,050 cu. ft.

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Ellington Field—Training operations, in which every qualified pilot of Ellington Field will participate, began on May 1. The first week's schedule consisted of tactical formation training by squadrons of full strength. Pilots have been assigned in equal numbers to the 94th and 27th Squadrons.

Army Orders—First. Lieut. Ernest S Moon, A.S., having completed his temporary duty at Aberdeen Proving Ground, Md., is relieved from further station at Langley Field, Va., and will report at Aberdeen Proving Ground for duty.

Lt. Col Clarence C. Culver, A S., relieved from duty as student at the Army War College, Washington Barracks, D. C., has been appointed air officer with the Eighth Corps Area, relieving Maj Frank D Lackland, A S

Capt. Carl W Connell, A.S., relieved from further duty with the L.W F Engineering Corp., College Point, L. I., has been directed to proceed to the Aeromarine Plant, Keyport, N. J., for duty as inspector

First Lieut. John D. Borriger, A S., and First Lieut. Thomas L. Gilbert, A.S., have been detailed to temporary duty with summer training camps in the Seventh Corps Area, at Fort Crook, Neb.

First Lieut. Thomas J Gilbert, A.S., has been detailed from the 20th Bombardment Squadron, Kelly Field, Tex., to the summer training camp activities of the Seventh Corps Area.

Capt. Richard H. Ballard, A.S., and Lieut. Thomas H. Chapman, A. S., have been detailed to temporary duty with the summer training camp activities in the Sixth Corps Area, with station at Chanute Field, Ill

Capts. John O Colgan, Harry C Drayton and Thomas S Voss, Air Service, have been detailed to temporary duty with the summer training camp activities in the Third Corps Area

Capt. John J. Devery, jr., A.S., and Lieuts. Edgar E Glenn and Harold A McGinnis, A.S., have been detailed to temporary duty with the summer training camps of the Fifth Corps Area.

Capt. Romeyn B. Hough, jr., A.S., and First Lieuts. Charles H Dowman and Walter T Meyer, A S., have been detailed to temporary duty with the summer training camp activities of the Fourth Corps Area.

Capt. John W Signer, A S., and Lieuts. Joseph P Bailey and Charles A Horn, A S., have been detailed to temporary duty with the summer training camp activities of the Ninth Corps Area

Maj Herbert A Dargue, A S., is detailed as a member of the Aeronautical Board, vice Lieut. Col Arthur L. Fuller, C A C., relieved.

Maj Lewis H Brereton, A S., relieved from his present duty as assistant military attache, Paris, France, is transferred to Post Field, Okla

Maj. Carlyle H. Walsh, A S., relieved from his present duty in the office of the Chief, Militia Bureau, is detailed as assistant military attache, Paris, France.

Maj Benjamin D. Foulois, A.S., and Maj Harold Geiger, A S., in addition to their present duties as assistant military attaches, American Embassy, Berlin, Germany, are detailed as assistant military attaches to the American Legations in Copenhagen, Denmark; Christiania, Norway; and Stockholm, Sweden

Capt. Fredrick F Christine, A S., and First Lieut. Edward F. Carey, A. S., have been transferred from the O C A.S to Fairfield Air Intermediate Depot, Ohio, and Middletown Air Intermediate Depot, Pa., respectively

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103rd Division, Air Service—The organization of the 103rd Division, Air Service, Colorado Springs, Colo., as to the assignment of officers is just about complete, there being a few vacancies yet in the grades of Captain and First Lieutenant, and a surplus in the grade of 2nd Lieutenant. Enlistments for the 103rd Division, Air Service, have not as yet been undertaken due to lack of a clerk and office equipment and supplies. Hope is entertained that this deficiency will be supplied in the very near future.

The officer on duty with the Division Air Service at once set about to locate a suitable landing field where he could invite visiting ships to land, the information found in "Notice to Aviators" for Jan. 1, 1922, concerning a field in this locality, not being reliable. An excellent field was located, and permission to use same has been granted by the owner With the assistance and cooperation of a local flier, a 40-ft. white circle was made in the center of the field, and a standard wind sock placed at one end of a pole. This information, with a sketch of the field, was sent to the Chief of Air Service; Air Officer of the 8th Corps Area, Post Field, Fort Sill, Okla., and Kelly Field, Tex.

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Mitchel Field—The Air Service Detachment, consisting of two officers and 83 men, arrived at Mitchel Field on May 4, from Germany. This detachment was apparently assigned to Mitchel Field to be broken up and the personnel distributed to other Air Service stations. This fact is regretted very much by Mitchel field, because it is found that the detachment contains some very excellent soldiers and mechanics. The officers reporting with the detachment, 1st Lieuts. Dogan Arthur and Russell M. Greenalade, A S., have been ordered to report to Langley Field and Kelly Field, respectively

In the course of dummy bombing demonstration given on Memorial Day Lieut. Victor E. Bertrandas hit the "battleship" Rock-and-Rye from an altitude of 3000 ft. three times. He was not unduly elated when he descended, however, for Rock-and-Rye was the name given to a warship model of wood and canvas, 25 ft. long, which served as a target.

The "battleship" Rock & Rye which was bombed at Mitchel Field on Memorial Day

At 2500 ft. Lieutenant Bertrandas missed the Rock-and-Rye by 100 ft He mounted to the 3000-ft level and dropped five more bombs, the first three of which landed fairly on the target, which burst into flames. A brisk wind was blowing at the time. Lieut. L. V. Bean was pilot.

There was a ten-mile relay race at the field also, in which each contestant used two airplanes and made the trip from the first to the second in a wheelbarrow. Lieut. F. C. Fishback won. Capt. I S Eaker won another ten-mile airplane race.

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Shoen Field Dedicated—Under the auspices of the 464th Pursuit Squadron, Organized Reserves, the 100-acre tract used as a flying field at Fort Benjamin Harrison, Ind., was dedicated to the memory of Lieut. Carl Shoen on May 7. Lieut. Shoen was a native of Indianapolis and at the time he was shot down, in 1918, he had been credited with seven enemy airplanes. In his last combat he was engaged with a superior number of the enemy Mrs. Shoen, his mother, was present at the ceremony

All roads and available space around the field were jammed with the parked cars of the spectators The crowd surrounded a flag-draped Martin Bomber Transport. The nose of this ship was used as a speaker's platform. Maj Gen. George W. Read, Fifth Corps Area Commander, made an appropriate talk and then introduced Judge Robinson, of Indianapolis, who recounted the life and deeds of Lieutenant Shoen.

Following the speeches, there was a battalion parade and then the spectators were shown the different planes, DeHavilands, Curtiss, and a big Martin "U S Transport" which began to warm up for the return flight to McCook Field, piloted by its skipper, Lieutenant Wade. The day was perfect for flying

Overseas Dead Reinterred at Arlington—Two officers and twelve enlisted men, whose remains have been returned to the United States, were reinterred in the Arlington National Cemetery June 8 Chaplains John J Campbell and William R. Scott conducted the services.

Among those buried were the remains of Alford J Bradford, 1st Lt 12th Aero Sq (20 F.A.) and Edward T Hathaway, 1st Lt., 90th Aero Sq. (S R C.)

Naval Aviation

Naval Orders—Lieut John F Moloney, to Naval Air Station, Pensacola, Fla.

Lieut. Fleete S Steele, (Med. Corps), det U S S Aroostook, to Naval Air Station Pearl Harbor, T. H

Lieut. Brython P Davis, (Med Corps), det Naval Air Station Pearl Harbor, T. H., to U S S Aroostook.

Lieut. John J Ballentine, det. Air Squadrons, Atlantic Fleet, to Lower Station, Dahlgren, Va.

Lieut. Richard H Gifford (Civ. Eng Corps), det. Bu Yards and Docks, Navy Dept., to public works officer, Naval Air Station, Pensacola, Fla.

Lieut Comdr Frederick C Bowerfind (Supp. Corps), det. Naval Supply Depot, South Brooklyn, N Y.; to supply officer, U.S.S Langley.

Lieut. Noel Davis, det. Naval Air Station Pensacola, Fla., resignation accepted

Lieut. James R Allen (C.C.), det. Mass Institute of Technology, Cambridge, Mass.; to Naval Aircraft Factory, Philadelphia, Pa.

Lieut (j.g.) George H. Hines, R.F., to duty Naval Aircraft Factory, Philadelphia, Pa.

Lieut. Charles A Nicholson (C.C.), det. Navy Yard, Boston, Mass., to Naval Aircraft Factory, Philadelphia, Pa.

Lieut. Leslie C Stevens (C C.), det. Navy Yard, Boston, Mass., to Naval Aircraft Factory, Philadelphia, Pa.

Lieut. Theodore T. Patterson, det U S S. Nevada; to Bu. Aeronautics, Washington, D C.

Ens. Phil. L. Haynes, det. U. S. S. Delaware; to Naval Air Station, Hampton Roads, Va.

The following Reserve Force officers have been ordered "to home"; Lt. (j.g.) Reginald W. Artur, Naval Air Station Pensacola, Fla., Lieut. Robert R. Bottoms and Lieut. Smith N. Bradford, both det. Naval Air Station Lakehurst, N J.; Lieut Bert H. Creighton, Lieut. Allen H. Elward, and Ens. William P. Cassidy, det. Naval Air Station Hampton Roads, Va.

The following Reserve Force officers have been honorably discharged from active service: Lieut. Comdr James H. Hawkins, det. Air Squadrons, Atlantic Fleet; Lieut. (j.g.) Marion Botler, jr., det. Naval Air Station Anacostia, D C

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Pensacola Naval Air Station—With the aid of battery of 3-in. guns mounted on Rosa Island, the training of naval spotters at Pensacola, Fla., is now carried on with increased efficiency according to a report from the Commandant of the Naval Air Station, Pensacola.

Spotting practice is considered one of the principle duties of a naval aviator in connection with the observation and control of fire from the fleet His is an unique position, high above the scene of a capital ship in action, where he can view the splash of his ship's salvoes, and judge the needed correction to bring the shells on the enemy fleet. Today student aviators are sent aloft at Pensacola in standard spotting planes, while the battery on shore fires at one or more targets out at sea. Observing the splash of the 3-in. guns, which reproduce actual conditions on a reduced scale, he advises the battery immediately by radiophone what correction to make and another salvo is fired Spotting from the air is found to be far more accurate than from the fighting top of a battleship, and with the installation of plane launching devices on our fighting ships it will not be long before every ship of the navy has its quota of trained flying spotters who will cooperate with the gun crews of his ship

Hampton Roads Naval Air Station—The personnel of Scouting Squadron No 1, composed of Wright, Teal and Sandpiper, now at the Philadelphia Navy yard recently tested out the six new F5L airboats erected at the Philadelphia factory. The airboats were found to be very satisfactory according to reports to the Navy Department. They are all equipped with the latest type of aircraft radio sets including a complete emergency set, carrying a kite aerial for sending when on the water, and good for up to approximately 175 miles. On May 26 the six airboats were flown to Hampton Roads Air Station.

Four pilots of Torpedo-Plane Squadron No 1, based at Hampton Roads, flew as many new planes from Philadelphia to Hampton Roads recently as the first consignment of eighteen new planes assigned to this squadron.

The U.S.S Wright, now at Philadelphia, is scheduled to become not only quarters for the personnel of the Air Squadrons, but a mobile base too, enabling the planes to cruise with the fleet The Wright carries spares and supplies as well as 40,000 gal of gasoline. The balloon-well in her after deck is a new feature in sea going craft, enabling her to serve as a mothership for kite balloons. She is also equipped with a hydrogen manufacturing plant.

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Sea Lion with Air Squadrons, Pacific Fleet—Recently one of the F5L airboats of the Air Squadrons of the Pacific Fleet was resting on the water near the Coronado Islands, off the California coast, when a young sea lion crawled into the plane and proceeded to make himself at home Being apparently perfectly comfortable, it was allowed to remain, and stayed several hours while the plane was in flight. So it was brought back to the beach, a pen was built near the hangars and turned over to the guest as its regular quarters. The pet rapidly became popular and has now been adopted as the mascot of the Air Squadrons.

It undoubtedly likes its new friends, for it has been turned loose several times to splash around the bay, and each time after an hour's exercise it returns to its home by the hangar. This type of sea lion is not the many headed type of the ancient mariners, but an animal native to the Pacific Ocean. It is much like a seal, and about 6 ft. in length from the tip of its nose to its tail

Coming Aeronautical Events

AMERICAN

Sept. 4 —	*Detroit Aerial Water Derby, Detroit. (Curtiss Marine Flying Trophy Competition.)*
Sept. 30 —	*First Annual Interservice Championship Meet. (In preparation.)*
Oct. 12-14 — (about)	*Detroit Aerial Derby, Detroit. (Pulitzer Trophy Race.)*

FOREIGN

August —	*Coupe Jacques Schneider. (Seaplane speed race.) Naples, Italy.*
August —	*Tyrrhenian Trophy (International Seaplane Competition) Naples, Italy*
Aug. 6 —	*Gordon Bennett Balloon Race, Geneva, Switzerland.*
Aug. 6-20 —	*Soaring and Gliding Competition, Clermont-Ferrand, France.*
Aug. 9-24 —	*Soaring and Gliding Competition, Gersfeld, Germany.*
September —	*Grand Prize of Italy (International Airplane Competition.) Milan, Italy*
Sept. 22 —	*Coupe Henri Deutsch de la Meurthe. (Airplane speed race.) France. American elimination trials, if required, to be held about Aug. 15, at Mitchel Field, L. I.*
October —	*International Parachute Competition. Rome, Italy.*

Foreign News

Great Britain—The British Air Ministry has made the following announcement on the first flight hy night over the British portion of the Continental Air Ronte which was carried ont hy an Air Ministry machine in order to test the ground organization which has been established for commercial flying hy night between London and the Continental capitals.

"The airplane, which carried eight people, inclnding a navigator, wireless officer, and the Air Ministry officials responsihle for the lighting and wireless arrangements of the route, left Biggin Hill about 8:30 p. m., flew to the London terminal airdrome, Croydon, and landed there. The pilot in charge, who has had great experience, expressed the view that the flood lighting arrangements on the airdrome hy means of dispersed searchlight beams, together with the illuminated landing 'L's' were the best he had seen and made landing as easy hy night as hy day.

"The aircraft left Croydon Airdrome abont 9.20 p. m. and steered a direct course for Lympne airdrome on the coast. Temporary aerial lighthouses were in action at Tatsfield and at Cranbrook, and these were easily picked np. Shortly after passing the Cranhrook Light the pilotage light on Lympne Airdrome became clearly visihle. The machine then flew over Lympne Airdrome and continned over the Channels toward St. Inglevert, the first airdrome on the French side. The Marine Lighthouse at Cap Gris Nez, which had been visihle as soon as the aircraft was over Biggin Hill, gave an excellent leading mark and very soon the French aerial lighthouse on St. Ingelvert Airdrome also came in sight. Turning hack on its course the airplane then crossed the coast near Folkestone and headed direct for the pilotage light at Lympne, at which airdrome an easy and smooth landing was effected. Leaving this station at abont 11.30 p. m., a course was retraced to Croydon, the lights of the terminal airdrome being easily picked ont from all the mass if lights of Croydon and London generally. After circling Croydon Airdrome the aircraft was headed for Biggin Hill, where a landing was effected with the help of wing tip flares and ground flares."

. It is announced that the seaplane floating dock, which has been under construction at Sheerness Dockyard to the orders of the Air Ministry, has now been delivered as ready for service. For the present, the craft has been berthed in the Medway, near Port Victoria. The dock, which has an overall length of 143 ft. and a lifting capacity of 200 tons, will accommodate two large modern seaplanes, has thirteen hnoyancy compartments, each flooded direct from the sea and emptied by hlowing with compressed air. The power for the air compressors is supplied hy two oil-driven dynamos, which also provide the current for lighting and power for workshop machinery, capstans, winches and pumps. An interesting feature is the supply of gasoline to seaplanes from a large storage tank on the deck hy means of the Bywater hydranlic system.

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Switzerland—An elaborate program has been puhlished hy the city of Geneva heralding the many festive and sport events which are scheduled to take place during the Gordon Bennett week, from Aug. 2 to 6, next.

Competitions in distance flights for halloons of the first, second, third and fourth category will open the aerial events on Aug. 2, followed the next day hy a halloon-antomobile rally organized hy the Swiss Antomohile Clnh and the Swiss Touring Clnh. On Friday, Aug. 4, there will be contests for balloons of all categories. The Gordon Bennett Cup Race is schednled for Snnday, Aug. 6, when twenty balloons, three representing the U.S.A., three England, three France, three Italy, three Belginm, two Spain and three Switzerland will start in this contest.

The meeting is organized by the Aero Clnh of Switzerland and its affiliated section at Geneva, the Swiss Aviation Clnh, the Association of the Interests of Geneva and the city of Geneva, under the Honorary Presidency of Mr. Haah, President of the Swiss Confederation and Prince Roland Bonaparte, President of the International Aeronantic Federation.